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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/670,975	09/25/2003	Kum Foo Leong	884.951US1	8112
21186	7590	04/17/2006	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			RODGERS, COLLEEN E	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 04/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/670,975	Applicant(s) LEONG ET AL.	
	Examiner Colleen E. Rodgers	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 February 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13, 21-27, 31-33 and 35-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 7-10, 21-27, 31-33 and 35-40 is/are allowed.
- 6) ☒ Claim(s) 1-6 and 11-13 is/are rejected.
- 7) ☒ Claim(s) 3, 25, 39 and 40 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date: _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action responds to the Amendment filed 2 February 2006. By this amendment, claims 1, 4, 7, 11, 12, 21, 23-27, 31, 33 and 38 are amended and claim 34 is canceled.

Claim Objections

2. Claims 3, 25, 39 and 40 are objected to because of the following informalities:

regarding claim 3, change the dependency from claim 3 to claim 2. This objection is maintained from the Office Action dated 1 November 2005;

regarding claim 25, remove the comma between “interfacial adhesion layer” and “results in interdiffusion” in line 2;

regarding claim 39, change the dependency from claim 31 to claim 38. This objection is maintained from the Office Action dated 1 November 2005;

regarding claim 40, change the dependency from claim 31 to claim 38. This objection is maintained from the Office Action dated 1 November 2005.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Art Unit: 2813

4. Claims 1, 4, and 11-13 rejected under 35 U.S.C. 102(e) as being anticipated by **Kailasam** (US Patent Application Publication 2005/0181598).

Regarding claim 1, **Kailasam** discloses a method for forming a via in an integrated circuit packaging substrate comprising:

making a via opening 8 (called “feature”) having a base [see Fig. 1], the base of the via opening positioned at a selected level that includes a first conductive material within the integrated circuit packaging substrate [see Fig. 1];

depositing an interfacial layer material 22 (called “adhesion layer”) within at the base of the opening [see Fig. 2];

placing a second conductive material 24 (called “diffusion barrier”) over the interfacial material 22; and

directing energy to the base of the opening to heat the materials at the base of the opening [see paragraph 0014].

Regarding claim 4, **Kailasam** discloses the method of claim 1 as described above, wherein the interfacial material is a material that will diffuse into at least one of the first conductive material or the second conductive material at the temperature produced by heating the materials at the base of the via opening [see paragraph 0014].

Regarding claim 11, **Kailasam** discloses the method of claim 1 as described above, wherein placing the second conductive material over the interfacial material includes plating copper 32, 34 within the via opening [see paragraph 0014].

Regarding claim 12, **Kailasam** discloses the method of claim 1 as described above, wherein placing the second conductive material over the interfacial material further comprises plating copper by either electroless or electrolytic methods [see paragraph 0014].

Regarding claim 13, **Kailasam** discloses the method of claim 1 as described above, further comprising capping the via 30 [see Fig. 3].

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kailasam** (US Patent Application Publication 2005/0181598) in view of **Cohen et al** (US Patent Application Publication 2005/0215046 A1).

Regarding claim 2, **Kailasam** discloses the method of claim 1 as described above. **Kailasam** does not disclose the step of masking the surface of the integrated circuit packaging substrate, a mask being formed having a mask opening therein positioned above to the base of the via opening. **Cohen et al** discloses the use of a conformable contact (CC) mask for use in selective deposition, wherein the conformable material for each mask is shaped in accordance with a cross-section of the material to be plated [see paragraph 0020]. It would have been obvious to one of ordinary skill in the art at the time of invention to use the mask of **Cohen et al** during the deposition steps of **Kailasam** because the conformable material of the CC mask of **Cohen et al** acts as a barrier to electrodeposition [see paragraph 0022].

Regarding claim 3, the prior art of **Kailasam** and **Cohen et al** discloses the method of claim 2 as described above. **Cohen et al** further discloses the step of removing the mask [see paragraph 0023].

7. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kailasam (US Patent Application Publication 2005/0181598) in view of **Chan et al** (USPN 6,495,200 B1). **Kailasam** discloses the method of claim 1 as described above. **Kailasam** does not disclose that the interfacial material may be selected from the group consisting of palladium, platinum, cobalt or nickel. **Chan et al** discloses a method of forming a via including depositing an interfacial layer 13 within at the base of the opening [see Fig. 1A] and placing a conductive material 16 over the interfacial material 13. Furthermore, **Chan et al** discloses wherein the interfacial material includes palladium [see col. 4, lines 27-34]. It would have been obvious to one of ordinary skill at the time of invention to use palladium as the interfacial material because the application process of dip coating or spin-on is less expensive than the CVD process required to deposit other materials [see col. 4, lines 11-14].

Allowable Subject Matter

8. Claims 7-10, 21-27, 31-33 and 35-40 are allowed. The prior art of record fails to teach or make reasonably obvious heating the materials at the base of the via using a laser (as required by independent claim 7) or the formation of teeth-like structures (as required by independent claims 21, 31 and 38).

Response to Arguments

9. Applicants' arguments, see Remarks, filed 2 February 2006, with respect to claims 1, 5, 6, 11, 13 and 21-24 (rejected under 35 U.S.C. §102(a) as being anticipated by **Chan et al**) have been fully considered and are persuasive. The rejection thereof has been withdrawn.

10. Applicants' arguments, see Remarks, filed 2 February 2006, with respect to claims 21, 25, 31, 35, 38, 38 and 40 (rejected under 35 U.S.C. §102(e) as being anticipated by **Kailasam**) have been fully considered and are persuasive. The rejection thereof has been withdrawn.

11. Applicants' arguments, see Remarks, filed 2 February 2006, respect to claims 1, 4 and 11-13 (rejected under 35 U.S.C. §102(e) as being anticipated by **Kailasam**) have been fully considered but they are not persuasive. Applicants allege that **Kailasam** fails to teach "...directing energy to the base of the opening to heat the materials at the base of the opening." Examiner disagrees. The general heating step of **Kailasam** directs energy to the base of the via, as well as to the rest of the packaging substrate. Absent the exclusion of the remainder of the packaging substrate in the instant claims, the prior art of **Kailasam** anticipates the claims as described above.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be

Art Unit: 2813


calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colleen E. Rodgers whose telephone number is (571) 272-8603. The examiner can normally be reached on Monday through Friday, 9:00 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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